Experiment -9

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Subject Name: Project-Based Learning in Java with Lab **Subject Code: 22CSH-359**

9.1.1 Aim: To demonstrate dependency injection using Spring Framework with Java-based configuration.

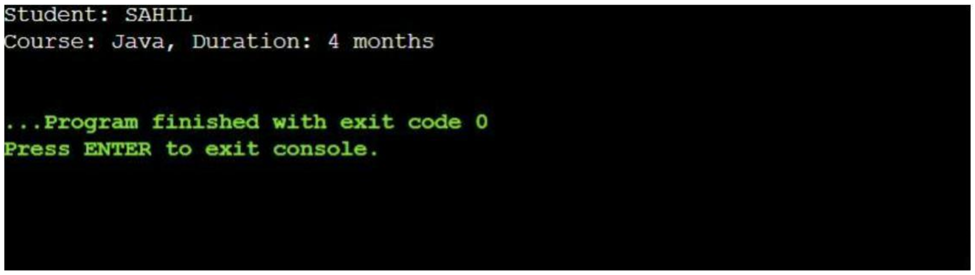
9.1.2 Objective:

Define Course and Student classes.
Use Configuration and Bean annotations to inject dependencies. Load Spring context and print student details.

9.1.3 Code:

```
public class Course {
    private String courseName; private
    String duration;

    public Course(String courseName, String duration) { this.courseName =
        courseName;
        this.duration = duration;
    }

    public String getCourseName() { return courseName; } public
    String getDuration() { return duration; }

    @Override
    public String toString() {
        return "Course: " + courseName + ", Duration: " + duration;
    }
}

public class Student { private
    String name; private Course
    course;
    public Student(String name, Course course) {
        this.name = name;
        this.course = course;
    }

    public void showDetails() { System.out.println("Student: " +
        name); System.out.println(course);
    }
}
import org.springframework.context.annotation.*;

@Configuration
public class AppConfig { @Bean
    public Course course() {
        return new Course("Java", "3 months");
    }

    @Bean
    public Student student() {
        return new Student("Aman", course());
    }
}
import org.springframework.context.ApplicationContext;
import org.springframework.context.annotation.AnnotationConfigApplicationContext;

public class MainApp {
    public static void main(String[] args) { ApplicationContext
        context = new
AnnotationConfigApplicationContext(AppConfig.class); Student
        student = context.getBean(Student.class);
        student.showDetails();
    }
}
```

Output:



```
Student: SAHIL
Course: Java, Duration: 4 months


...Program finished with exit code 0
Press ENTER to exit console.
```

Experiment -9.2

Aim: To perform CRUD operations on a Student entity using Hibernate ORM with MySQL.

Objective: Define Course and Student classes.

Use Configuration and Bean annotations to inject dependencies.

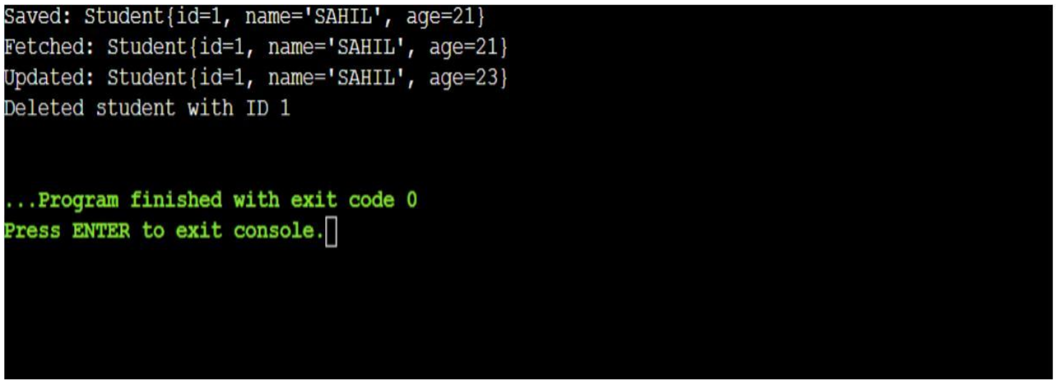
Load Spring context and print student details.

Code:

```
        <hibernate-configuration>
           <session-factory>
              <property
name="hibernate.connection.driver_class">com.mysql.cj.jdbc.Driver</property>
              <property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/testdb</property>
              <property name="hibernate.connection.username">root</property>
              <property name="hibernate.connection.password">password</property>
              <property
name="hibernate.dialect">org.hibernate.dialect.MySQL8Dialect</property>
              <property name="hibernate.hbm2ddl.auto">update</property>
              <mapping class="Student"/>
           </session-factory>
        </hibernate-configuration>

import javax.persistence.*;

Entity
public class Student {
   Id
   GeneratedValue(strategy = GenerationType.IDENTITY)
   private int id;
   private String name;
   private int age;

   public Student() {}
   public Student(String name, int age) {
      this.name = name;
      this.age = age;
   }
```

```
}
import org.hibernate.SessionFactory;
import org.hibernate.cfg.Configuration;

public class HibernateUtil {
    private static final SessionFactory sessionFactory;

    static {
        sessionFactory = new Configuration().configure().buildSessionFactory();
    }

    public static SessionFactory getSessionFactory() {
        return sessionFactory;
    }
}

import org.hibernate.*;

public class MainCRUD {
    public static void main(String[] args) {
        Session session = HibernateUtil.getSessionFactory().openSession();

        Transaction tx = session.beginTransaction();
        Student s1 = new Student("Aman", 22);
        session.save(s1);
        tx.commit();

        Student student = session.get(Student.class, 1);
        System.out.println(student);

        tx = session.beginTransaction();
        student.setAge(23);
        session.update(student);
        tx.commit();

        tx = session.beginTransaction();
        session.delete(student);
        tx.commit();

        session.close();
    }
}
```

Output:



```
Saved: Student{id=1, name='SAHIL', age=21}
Fetched: Student{id=1, name='SAHIL', age=21}
Updated: Student{id=1, name='SAHIL', age=23}
Deleted student with ID 1


...Program finished with exit code 0
Press ENTER to exit console.
```

Experiment -9.3

Aim: To implement a banking system using Spring and Hibernate that ensures transaction consistency during fund transfers.

Objective:

Integrate Spring + Hibernate.

Handle transactions atomically (rollback on failure).

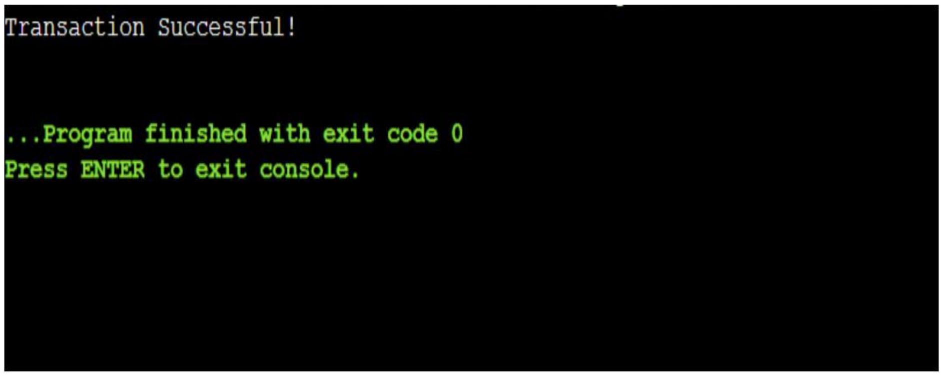
Demonstrate success and failure cases.

Code:

```
import javax.persistence.*;

Entity
public class Account { @Id
   private int accountId; private
   String holderName; private
   double balance;

}

import javax.persistence.*;
import java.util.Date;

@Entity
public class BankTransaction { @Id
   @GeneratedValue(strategy = GenerationType.IDENTITY)
   private int txnId;
   private int fromAcc;
   private int toAcc; private
   double amount;
   private Date txnDate = new Date();

}
import org.hibernate.*;
import org.springframework.transaction.annotation.Transactional;
```

```
public class BankService {
    private SessionFactory sessionFactory;

    public BankService(SessionFactory sessionFactory) {
        this.sessionFactory = sessionFactory;
    }

    @Transactional
    public void transferMoney(int fromId, int toId, double amount) { Session
        session = sessionFactory.getCurrentSession();

        Account from = session.get(Account.class, fromId); Account
        to = session.get(Account.class, toId);

        if (from.getBalance() < amount) {
            throw new RuntimeException("Insufficient Balance");
        }

        from.setBalance(from.getBalance() - amount);
        to.setBalance(to.getBalance() + amount);

        session.update(from);
        session.update(to);

        BankTransaction txn = new BankTransaction(fromId, toId, amount); session.save(txn);
    }
}
@Configuration
@EnableTransactionManagement
public class AppConfig {
    @Bean
    public DataSource dataSource() {
        DriverManagerDataSource ds = new DriverManagerDataSource();
        ds.setDriverClassName("com.mysql.cj.jdbc.Driver");
        ds.setUrl("jdbc:mysql://localhost:3306/testdb"); ds.setUsername("root");
        ds.setPassword("password");
        return ds;
    }

    @Bean
    public LocalSessionFactoryBean sessionFactory() {
        LocalSessionFactoryBean lsf = new LocalSessionFactoryBean();
        lsf.setDataSource(dataSource()); lsf.setPackagesToScan("your.package");
        Properties props = new Properties();
        props.put("hibernate.dialect", "org.hibernate.dialect.MySQL8Dialect");
        props.put("hibernate.hbm2ddl.auto", "update"); lsf.setHibernateProperties(props);
        return lsf;
    }

    @Bean
    public HibernateTransactionManager transactionManager(SessionFactory sf) { return new
        HibernateTransactionManager(sf);
    }

    @Bean
    public BankService bankService(SessionFactory sf) { return
        new BankService(sf);
    }
}

public class MainApp {
    public static void main(String[] args) {
        AnnotationConfigApplicationContext ctx = new
AnnotationConfigApplicationContext(AppConfig.class);
        BankService service = ctx.getBean(BankService.class);

        try {
            service.transferMoney(101, 102, 500);
            System.out.println("Transaction Successful!");
        } catch (Exception e) {
            System.out.println("Transaction Failed: " + e.getMessage());
        }
        ctx.close();
    }
}
```

OUTPUT:



```
Transaction Successful!


...Program finished with exit code 0
Press ENTER to exit console.
```

Learning Outcome:

- Learned how to define and manage **Spring beans** using @Configuration, @Bean, and dependency injection. I understood the working of a simple Java application wired using **Spring's ApplicationContext**, which improves modularity and decoupling.

- Explored **Hibernate ORM** to perform CRUD operations on a database using entity classes mapped via annotations. I learned how to configure hibernate.cfg.xml, establish a connection with MySQL, and use Hibernate's SessionFactory, Session, and Transaction objects to persist and manipulate data.

- Learned to combine both Spring and Hibernate to simulate a **real-world banking transaction system**. I learned how to handle transactions using @Transactional, manage dependencies using Spring's @Configuration and @Bean annotations, and implement business logic for transferring money securely between accounts with rollback support in case of errors.